

POSIDON Science Flight Report

2016-10-15 RF03

Takeoff: 0012 UT October 15 (10:12 Oct 15 Guam local)

Landing: 0500 UT October 15 (15:00 local), duration: 4.8 hours

Mission Scientists: Eric Jensen, Ru-Shan Gao

Pilots: Greg Johnson, Cary Klemm

Summary:

This flight provided an ideal opportunity to sample gases and clouds detrained from a tropical cyclone. The WB-57 profiled through the TTL throughout the flight, sampling cirrus just downstream of convection extending well above 50 kft and through thin cirrus up to the tropopause. Instruments performed well.

Flight Description:

On the morning of the flight, Tropical Cyclone Haima was situated just southwest of Guam (Figure 1). It was near enough to provide easy access by the WB-57, but not so close that stormy weather precluded takeoff and landing. The primary objective of the flight was to sample trace gas concentrations and cirrus microphysical properties in air detrained from deep convection associated with the tropical cyclone.

The aircraft initially ascended to 53 kft and headed west toward waypoint JOBSS north of the outer bands of convection and cirrus from Haima. After a descent to 43 kft, the MMS box, pitch, and yaw maneuvers were executed. The pilots then turned south toward waypoint PIGFA and climbed to 55 kft.

At this point an approximately east-west racetrack pattern with a length of about 100 nm was established downstream of the Haima convection in a band of high cirrus. The aircraft flew 2.5 circuits around this racetrack while ascending and descending through the TTL. The initial pressure altitude range was 43–55 kft. Cirrus was present much of the time during this profiling, with relatively high ice water contents at the lower altitudes. The cold-point tropopause was located just below 55 kft (about 100 hPa).

The real-time data indicated a layer of cirrus and low water vapor concentration just below the relatively cold temperature minimum (about 187 K, see Figure 2). Therefore, the profiling height range was changed to 51 to 57 kft. Prominent temperature oscillations were apparent in the tropopause region, presumably caused by waves driven by the deep convection in the region. Some evidence of SO₂ decreases within thick cirrus was noted (as on earlier flights), possibly indicating uptake of SO₂ by ice crystals.

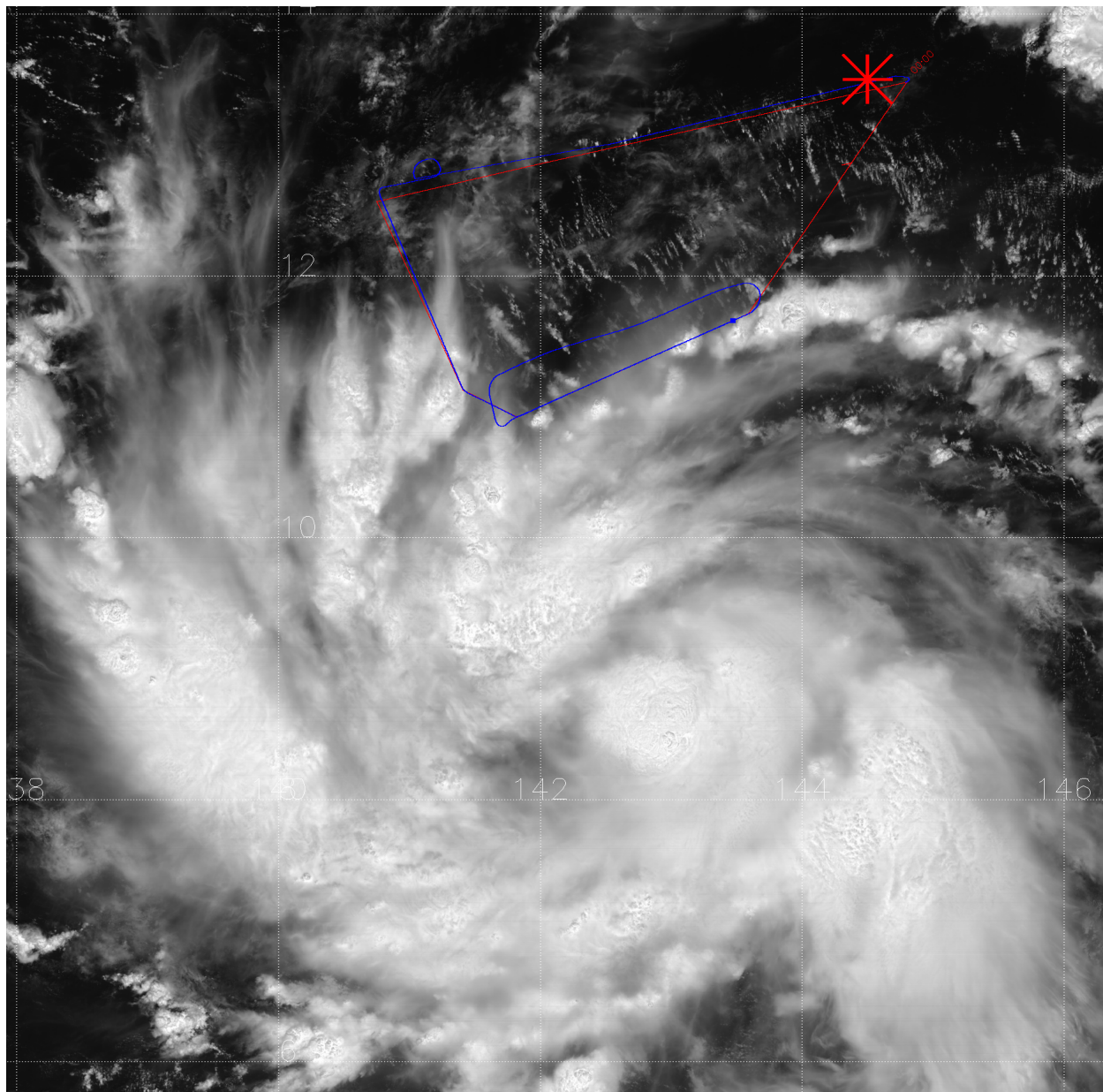


Figure 1. Visible satellite image during the sampling of cirrus and trace gases from tropical cyclone Haima. The red asterisk shows the location of Guam, and the flight path is shown in blue and red.

The flight was somewhat shorter than the aircraft maximum duration because the forecast team suggested the pilots RTB to arrive ahead of a band of rain showers (and associated wind gusts).

SID3 was removed prior to flight for replacement of a defective laser. All other instruments performed well.

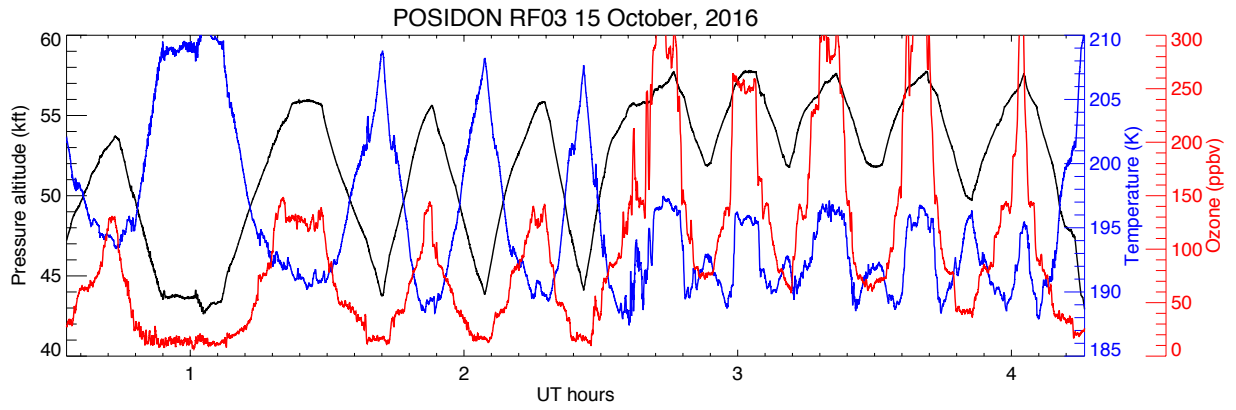


Figure 2. Time series of geometric altitude and static temperature measured by MMS.